great discretion. The dignified quarto which supplies a link with the early days of the society may be suspended, illustrations reduced to the absolute minimum, communications condensed or reduced, and every conceivable means adopted to avoid expense; but with a diminished sum available for printing, and printing costs trebled, it is obvious that the efficiency of the society as a means of publication must be seriously reduced.

This result bears heavily on oversea members The member within reach of town has all the advantages of the society; he can attend the meetings, consult the library, and meet his colleagues at the society's rooms; the country member is less favourably situated, but he has at least the privilege of borrowing from the library. The only material advantage received by the oversea member is the scientific publications of the society. The oversea members are an important part of the society, which, though "of London" in style, is world-wide in interest and membership. Our colleagues oversea, though in many cases supporting their own local society, consider it an honour to belong to the mother society at home, and the aim of the mother society is to strengthen the bond and to show the worker oversea that he is both welcome and necessary. Any step, therefore, which tends to lessen the advantages reaped by the oversea member must be avoided.

Apart from external aid there remains only the increased contribution from the individual member. An increase in the subscription will fall hard on many members; but the claims of a society which represents one's work or the scientific interest of one's leisure will not easily be set aside. A man or woman does not join a scientific society in a commercial spirit, but because a congenial atmosphere is there found, or, in the highest motive, because it is an obligation and an honour to help forward the society which represents one's own branch of science. If each member will consider seriously the position of his society, the claim for external aid, amply justified by the value to the community of the scientific work of the society, will come with increased power.

A. B. Rendle.

The leading article in Nature of May 6 has so admirably stated the case for assistance towards the publications of scientific societies that it is almost needless to add further arguments. Nevertheless, there is one point which seems to require attention, namely, that during the last two years, when the pressure of enhanced prices in the printing trade has made itself felt, there has been an attempt on the part of societies subject to this burden to palliate it by means which threaten to change the character of the meetings. To avoid the heavy cost of papers embodying recent research, there has developed a marked tendency to arrange for lectures and demonstrations of a kind which do not require publication in detail, to the disadvantage of original memoirs which demand illustration and extensive text. Should this procedure continue, it is plain that research will suffer, investigators will not be ready to produce the results of their work in the meetings, and the value of the societies' issues will be diminished.

If assistance of the kind advocated can be secured, former methods can be resumed; if that assistance is denied, it is to be feared that, in spite of stringent economy or increased subscriptions on the part of the societies, the publications will suffer; for the maintenance charges must first be met before the balance of income is available for printing memoirs.

B. Daydon Jackson.

I do not suppose that there is a single editor of a scientific journal who will not read with sympathy and gratitude of your effort to obtain financial support for such publications in view of the enormously increased cost of paper and printing. In the case of the *British Journal of Psychology,* with which I am specially connected, the subscription is being raised for the second time since the war, whilst no class has suffered more as regards income than that from which the subscribers to scientific journals are drawn.

Charles S. Myers.

30 Montagu Square, W.1, May 10.

The Indian Chemical Service.

Sir P. C. Rây's objections to the proposal to form an Indian Chemical Service are based upon the fact that the Education Department of India has failed to realise the importance of research in connection with university teaching. However, I feel sure that he would not advocate the abolition of that Department, much less would he wish to see the Indian Education Service a mere adjunct to some other branch of the public services, without even provincial directors to look after the interests of himself and his colleagues. Every member of a Service knows that, in the event of a difference arising between himself and a member of another Service, he will have the support of a senior member of his own Service at each stage until the matter is perhaps settled by the Viceroy himself. Even directors-general and members of council are human, and inclined to support members of their own Department against the world.

Prof. Thorpe does not dwell at any length on the personal aspect of the problem, but I gather from his letter that he appreciates the importance of it. I do not doubt that he has grasped the fact that, while the members of such units as the Geological Survey of India or the Indian Medical Service are contented with the conditions of their service, grave discontent prevails amongst the numerous scientific men attached to, but not members of, organised Services. The fact that many men holding such positions have thrown up their appointments and come home disgusted has added considerably to the difficulty in recruiting scientific men, and particularly chemists, for service in India. There is no alternative to the bureaucratic system of government for India, and the proposed scheme provides for its inherent defects.

It is, of course, essential that the director-general and the directors of provincial institutes should be chemists who have proved their capacity for research. The Geological, Botanical, and Zoölogical Surveys of India seem to get on fairly well under directors-general who are scientific experts, and I do not see the necessity for assuming that the head and sub-heads of the Chemical Service will be any less competent than those who have done distinguished service for India in other branches of science.

Knowing something of India, I believe that the proposed scheme is sound, and I wish it every success.

M. W. Travers.

Beacon Hall, Priory Gardens, Highgate,
May 15.

A New Method for Approximate Evaluation of Definite Integrals between Finite Limits.

1. If $f(x)=a+bx+cx^2+dx^3+gx^4+hx^5+jx^6+kx^7+lx^8+mx^9$, the value of $\frac{1}{4}[f(\frac{1}{10})+f(\frac{4}{10})+f(\frac{6}{10})+f(\frac{9}{10})]$ is

$$a+0{\cdot}5000b+0{\cdot}3350c+0{\cdot}2525d+0{\cdot}2028g+0{\cdot}1696h+0{\cdot}1455j+0{\cdot}1270k+0{\cdot}1120l+0{\cdot}0994m$$

which is approximately identical with

© 1920 Nature Publishing Group

$$a+0{\cdot}5000b+0{\cdot}3333c+0{\cdot}2500d+0{\cdot}2000g+0{\cdot}1667h+0{\cdot}1429j+0{\cdot}1250k+0{\cdot}1111l+0{\cdot}1000m,$$

that is, with

$$a+\tfrac{1}{2}b+\tfrac{1}{3}c+\tfrac{1}{4}d+\tfrac{1}{5}g+\tfrac{1}{6}h+\tfrac{1}{7}j+\tfrac{1}{8}k+\tfrac{1}{9}l+\tfrac{1}{10}m,$$

which is $\int_0^1 f(x)dx$.

An approximate evaluation of $\int_0^1 \mathrm{F}(x)dx$ is therefore given by

$$\tfrac{1}{4}[\mathrm{F}(\tfrac{1}{10})+\mathrm{F}(\tfrac{4}{10})+\mathrm{F}(\tfrac{6}{10})+\mathrm{F}(\tfrac{9}{10})].$$

2. The following table shows for several functions the value of the integral and the approximate evaluation by this four-ordinate rule and by two *seven*-ordinate rules in common use, viz. :—

Simpson's rule :—

$$\int_0^1 \mathrm{F}(x)dx=\tfrac{1}{18}[\mathrm{F}(\tfrac{0}{6})+\mathrm{F}(\tfrac{6}{6})+2\{\mathrm{F}(\tfrac{2}{6})+\mathrm{F}(\tfrac{4}{6})\}+4\{\mathrm{F}(\tfrac{1}{6})+\mathrm{F}(\tfrac{3}{6})+\mathrm{F}(\tfrac{5}{6})\}], \text{ approx.}$$

Weddle's rule :—

$$\int_0^1 \mathrm{F}(x)dx=\tfrac{1}{20}[\mathrm{F}(\tfrac{0}{6})+5\mathrm{F}(\tfrac{1}{6})+\mathrm{F}(\tfrac{2}{6})+6\mathrm{F}(\tfrac{3}{6})+\mathrm{F}(\tfrac{4}{6})+5\mathrm{F}(\tfrac{5}{6})+\mathrm{F}(\tfrac{6}{6})], \text{ approx.}$$

F(x)	$\int_0^1 \mathrm{F}(x)dx$	New rule	Simpson	Weddle
Semicircle $(x-x^2)^{\frac{1}{2}}$	$\frac{\pi}{8}=0{\cdot}3927$	0·3949	0·3815	0·3835
Quadrant $(1-x^2)^{\frac{1}{2}}$	$\frac{\pi}{4}=0{\cdot}7854$	0·7868	0·7775	0·7789
$(4x-x^2)^{\frac{1}{2}}$	$\frac{2}{3}\pi-\frac{\sqrt{3}}{2}=1{\cdot}228$	1·231	1·217	1·219
$\log(1+x)$	$2\log 2-1=0{\cdot}3863$	0·3859	0·3863	0·3863
e^x	$e-1=1{\cdot}718$	1·720	1·718	1·718
$\frac{1}{1+x}$	$\log 2=0{\cdot}6931$	0·6937	0·6932	0·6931
$\frac{1}{2+x}$	$\log\frac{3}{2}=0{\cdot}4055$	0·4056	0·4055	0·4055
$\sin x$	$1-\cos\frac{180^\circ}{\pi}=0{\cdot}4597$	0·4593	0·4597	0·4597

3. The approximation is convenient for the practical determination of the area of a closed curve, such as an indicator diagram. The arithmetical mean of the ordinates at one-tenth, four-tenths, six-tenths, and nine-tenths of the range is the mean ordinate for the range.

The decimal division of the range, the use of only four ordinates, the extremely simple arithmetic involved, and the degree of accuracy attained should make the rule of practical value.

A. F. DUFTON.

Trinity College, Cambridge,
April 30.

British and Metric Systems of Weights and Measures.

ARE not those who discuss the relative claims of 4 mils and 5 mils as the substitute for the penny in a decimal division of the pound merely trying to minimise the disadvantages of what must in any case be a change for the worse? It seems that the advantage of any given system of weights or measures lies largely in the facilities that it offers for the division of a sum or quantity into equal parts. In this respect any decimal system is deficient by the absence of the factor 3, and by the frequency of the factor 5, which is of much less use than 4 for practical purposes. The *reductio ad absurdum* of the metric system seemed to be reached in the issue in Portugal some years ago of a 2½ reis postage stamp (they now call it ¼-cent). A rei is one-thousandth part of a milrei or dollar, about equal to one-twentieth of a penny—surely a small enough unit for any purpose, and yet it is found necessary to halve it!

The following comparison seems instructive :—

No. of farthings in one pound $=960=2^6\times3\times5$.
This has 11 factors between 1 and 20,
20 factors between 1 and 100.
No. of inches in one mile $=63{,}360=2^7\times3^2\times5\times11$.
This has 14 factors between 1 and 20,
34 factors between 1 and 100.
No. of ounces in one ton $=35{,}840=2^{10}\times5\times7$.
This has 9 factors between 1 and 20,
17 factors between 1 and 100.
No. of grains in one lb. troy $=5760=2^7\times3^2\times5$.
This has 13 factors between 1 and 20,
26 factors between 1 and 100.
No. of seconds in one day $=86{,}400=2^7\times3^3\times5^2$.
This has 13 factors between 1 and 20,
32 factors between 1 and 100.

Contrast with these :—

No. of millimetres in one kilometre, or of grammes in one metric tonne $=1{,}000{,}000=2^6\times5^6$,
which has only 7 factors between 1 and 20,
14 factors between 1 and 100.

If all the above five English systems be taken together, it will be found that :—

The factor 2	occurs	37 times
,, ,, 4	,,	17 ,,
,, ,, 8	,,	11 ,,
The factors 3, 6, and 12	occur	8 ,,
,, ,, 5, 10, 16, and 20	,,	6 ,,
The factor 15	occurs	5 ,,
The factors 9 and 18	occur	3 ,,
And the factors 7, 11, and 14	,,	once each.

Now, though it cannot be contended that the man who wants to divide 100*l.* into seven parts is helped by the fact that there are 28 lb. in a quarter, or he who would divide a ton into eleven parts by the number of yards in a furlong, yet it seems worthy of note that in our admittedly heterogeneous system all the numbers below 20, except 13, 17, and 19, should be represented as factors, and that to an extent so nearly proportional to their probable utility.

M. E. YEATMAN.

Parliament Mansions, May 7.

Scientific Apparatus and Laboratory Fittings.

I AM surprised to see that Prof. W. M. Bayliss, who writes in NATURE of May 6 on the proposed Anti-Dumping Bill, has misunderstood the Bill so far as it relates to scientific instruments. This Bill does not propose a tariff, but prohibition, except under licence.

The British Optical Instrument Manufacturers' Association has urged the Government to act by prohibition except under licence rather than by tariff, and this is what the Bill proposes. It has always considered that the effect of a tariff might, as Prof. Bayliss suggests, give "no inducement to the makers to improve the quality"; and it has urged that licences should always be freely granted where articles were not being made in the required quantity or up to the standard of quality of goods that could be imported from abroad.

© 1920 Nature Publishing Group